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ABSTRACT

A study examined the effect of word processing on students' revision of compositions and attitudes toward writing. Sixty seventh-grade students enrolled in a required writing course were randomly assigned to either the experimental or the control group. The experimental group used a word processor for all stages and aspects of writing, while the control group used pen and paper exclusively. All the subjects wrote seven one-paragraph assignments during the nine-week treatment period. No significant difference was found in the students' attitude toward writing--measured before and after treatment by survey--as a result of word processing. Furthermore, using the Stanford Achievement Test subtests for spelling and language, the study concluded that word processing had no effect on students' spelling and punctuation. Overall, the experimental group made more revisions than did the control group, but when revisions were divided into levels (minor, intermediate, and major), the control group made more minor revisions, the groups did not differ significantly in the number of intermediate revisions they made, and the experimental groups made significantly more major revisions than the control group. The study concluded that though word processing did not affect students' attitudes toward writing or their ability to recognize incorrect punctuation or spelling, it did help students revise more and at a higher level. (A three-page list of references, tables providing statistical information, and an appendix illustrating a writing attitude survey are included.) (Author/SRT)

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THE EFFECT OF WORD PROCESSING
ON
REVISION
AND
ATTITUDE TOWARD WRITING

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by

Joyce Easter Fitch

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Submitted in partial fulfillment of the requirements

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Lin,
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and
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TABLE OF CONTENTS

	Page
List of Tables.....	vi
Chapter	
I. BACKGROUND AND STATEMENT OF THE PROBLEM	
Introduction.....	1
Background.....	3
Research Questions.....	5
Hypotheses.....	6
II. SELECTED REVIEW OF LITERATURE.....	8
III. METHODOLOGY	
Procedures.....	16
Sample.....	20
Instruments.....	22
Attitude Toward Writing.....	22
Validity.....	25
Reliability.....	25
Spelling.....	26
Punctuation.....	26
Number of Revisions.....	26
Levels of Revisions.....	27

Data Collection.....	28
General Procedure.....	28
Attitude Toward Writing.....	28
Spelling and Punctuation.....	29
Number and Levels of Revisions.....	29
Non-quantitative Data.....	29
Data Analysis.....	30
Attitude Toward Writing.....	30
Spelling and Punctuation.....	30
Number of Revisions.....	31
Levels of Revisions.....	31

IV. RESULTS

Attitude Toward Writing.....	33
Parts I and II.....	33
Part III.....	33
Spelling.....	35
Punctuation.....	35
Number of Revisions.....	37
Level 1 Revisions.....	39
Level 2 Revisions.....	39
Level 3 Revisions.....	40

V. DISCUSSION

Attitude Toward Writing.....	41
Spelling and Punctuation.....	42
Levels of Revision.....	43
Number of Revisions.....	44
Teacher Suggestions.....	45
Recommendations for Future Studies.....	46
Conclusions.....	49
References.....	50
Appendix - Fitch Attitude Toward Writing Survey.....	54

LIST OF TABLES

Table	Page
1. Means, Standard Deviations, and ANCOVA F Ratios on the Fitch Attitude Toward Writing Survey.....	34
2. Means, Standard Deviations, and ANCOVA F Ratios on the Stanford Achievement Test Subtest of Spelling.....	36
3. Means, Standard Deviations, and ANCOVA F Ratios on the Stanford Achievement Test Subtest of Language.....	38

Abstract

The purpose of this study was to determine the effect of word processing on students' revision of compositions and students' attitude toward writing. Sixty seventh-grade students enrolled in a required writing course were randomly placed in either the Experimental Group (n=29) or the Control Group (n=31). Students in both groups completed seven one-paragraph written assignments during the nine-week treatment period. The Experimental Group used word processing for all aspects of writing --prewriting through final copy, while the Control Group used pen and paper.

Attitude toward writing was measured by the Fitch Attitude Toward Writing Survey using a test-retest design. Statistical significance was measured using analysis of covariance. No significant difference in the students' attitude toward writing as a result of word processing was found.

The Stanford Achievement Test subtests of spelling and language were used as a measure of students' ability to recognize spelling and punctuation errors. The 1984 and 1985 scores from

each of these tests were compared using analysis of covariance. The null hypothesis, that use of word processing has no effect on students' spelling and punctuation, was supported for both the spelling subtest and the language subtest.

The number of revisions made between rough and final copy was tallied and significance was measured using chi square. Students in the Experimental Group made significantly more revisions ($\chi^2=91.35$; $p=.0001$) than students in the Control Group.

Revisions were divided into three levels: Level 1 (minor), Level 2 (intermediate), and Level 3 (major). Each level of revision was tallied between rough and final copy, and significance was measured using chi square. The Control Group made significantly more Level 1 revisions ($\chi^2=6.02$; $p=.01$) than the Experimental Group. No significance was found in the amount of Level 2 revisions made by the Control and Experimental Groups. The Experimental Group made significantly more Level 3 revisions ($\chi^2=17.25$; $p=.0001$) than the Control Group.

This study concluded that word processing helps students write better. Seventh-grade students

revised more and at a higher level when using a word processing computer program. Word processing did not have an effect on students' attitude toward writing or students' ability to recognize incorrect punctuation or spelling on the Stanford Achievement Test subtests of spelling and language.

Suggestions are given in the study for future research in word processing and writing.

Chapter I

INTRODUCTION AND BACKGROUND OF THE PROBLEM

Introduction

Computers have been a part of education for decades, but only recently, with the advent of microcomputers, has education begun to realize the potential of these machines. Traditionally mathematics and science curricula have used computers for computation. Educators are now looking at the many facets of the computer and using it other than in mathematics. A variety of computer-assisted instruction is being used in almost all subject areas and grade levels. More teachers are also using application programs, such as data bases, spreadsheets, and word processing. English teachers are increasingly turning to word processing to help them teach many aspects of writing (Balkema, 1983; Halpern, 1982; Liggett, 1982; Horn, 1983; Karpen, 1983; Lucking, 1983; Mittricker, 1983; Wresch, 1982, 1984).

The most time-consuming and laborious part of the writing process is revision and rewriting. As a result, students tend to hurry through the revision

The most time-consuming and laborious part of the writing process is revision and rewriting. As a result, students tend to hurry through the revision part of the writing process or forego it altogether. Word processing makes revising compositions much easier than revising by hand because there is no need to rewrite and recopy an entire paper. The composition is simply loaded into the computer and displayed on the screen. Then text can be inserted or deleted at any point. Even large blocks of text can be moved to reorganize the composition. Using the same composition, formats can be displayed and changed until the best one is found. Thus, word processing takes much of the drudgery out of writing. Its use helps encourage students to write because students can avoid the time-consuming task of copying and instead can concentrate on revision and creativity. Since students can continually revise, writing becomes a recursive process. This constant revision is expected to lead students to make more revisions on rough copies than they would if they were writing by hand. Since students have already made minor revisions on rough copies, they are

expected to make higher level revisions on final copies.

Background

Although their reasons differ, many language arts educators agree that word processing has a positive effect on revision done by students and on students' attitude toward writing. The success of word processing, according to Stephen Marcus (1984), is that it is a "chance to play with a real-time gadget with feedback" (p. 127). In summarizing Neil Postman's observation in Teaching is a Conservative Activity, Marcus states that "there are important consequences to changing the form of information" (p. 128). According to Marcus, this change in medium from paper to computer creates a natural motivation for the student. His theory is that it is the newness of the machine rather than the ease of revision that creates motivation.

Bencivenga's (1982) statement that the word processor is a "great leap in the effectiveness of English teachers as teachers of writing" reflects the

opinion of most people who have used word processors. Moran (1983) points to his own experience as a teacher, his wife's as a professional writer, and his two children's as students. After using a word processor, each member of his family had a more positive attitude toward writing, had more confidence in his/her writing ability, and spent more time revising papers.

Ehrlich (1984), Fisher (1983), Hennings (1981), Bridwell and Ross (1984), and Womble (1984) worked with students who voiced the opinion that they liked writing more, revised more, and reorganized material more when they were using a word processing program than if they were writing by hand.

Though many teachers offer opinions, anecdotes, and ideas about the positive effects of word processing on students' writing and on students' attitude toward writing, there is little experimental research to support their claims. The purpose of this study is to investigate the effect of word processing on revision as well as on the attitude of the student toward writing. In addition, this study investigates the effect of word processing on the

students' ability to recognize spelling and punctuation errors.

Research Questions

The problem in this study is divided into five specific questions. Will seventh-grade students who use word processing in writing class:

- a. acquire a more positive attitude toward writing,
- b. show more improvement in punctuation,
- c. show more improvement in spelling,
- d. make more revisions when rough paragraph copies are compared to final paragraph copies,
- e. make higher level revisions when rough paragraph copies are compared to final paragraph copies,

than seventh graders who are taught without using word processing?

Hypotheses

In this study these five hypotheses are tested:

H₀₁ There will be no significant difference between seventh-grade students using word processing and seventh graders not using word processing in attitude toward writing.

H₀₂ There will be no significant difference between seventh-grade students using word processing and seventh graders not using word processing in the language subtest scores on the Stanford Achievement Test.

H₀₃ There will be no significant difference between seventh-grade students using word processing and seventh graders not using word processing in the spelling subtest scores on the Stanford Achievement Test.

H₀₄ There will be no significant difference in the number of revisions made between seventh-grade students using word processing and seventh graders

not using word processing when rough copies of paragraphs are compared to final copies.

H₀5 There will be no significant difference between seventh grade-students using word processing and seventh graders not using word processing in the levels of revisions made when rough copies of paragraphs are compared to final copies.

Chapter II

SELECTED REVIEW OF THE LITERATURE

In 1982 Sarah Liggett urged educators at the Annual Meeting of the Conference on College Composition and Communication to use experimental research designs to facilitate making sound decisions about how to teach the composing process. However, with few exceptions, published studies are based on teacher and student observations, and very often the sample used is very small in number or includes a homogeneous group. Although generalizations cannot be made from these studies, the results support the use of word processing to change students' attitude toward writing and to increase the number and types of revisions students make.

Monahan (1982) and Bradley (1982) observed small groups of students in studies which each lacked control. Monahan observed that students who worked in groups with a word processor seemed to make more revisions, and these revisions seemed to be at a higher level than students who did not use a word processor. Students showed high motivation and

positive attitudes by coming in early and using their free periods to work with the word processor.

Bradley observed 14 sixth graders and found that all had a positive attitude toward using word processing and all 14 students considered word processing easy to use. Bradley also observed similar results with first graders, but the teacher was actually using the word processor rather than the students.

Collier's study (1981) using the word processor with four nursing students was better controlled than Bradley's or Monahan's because Collier observed the students when they wrote without the word processor and when they wrote with the word processor. It is impossible to generalize from Collier's study because the sample is so small and homogeneous. However, Collier's observations indicated that the complex nature of the word processor used by his students was a major negative variable in his study, and that the attitude of the student toward the word processor was a major factor in the word processor's success or failure. He also observed an increase in the more complex operations of writing, and more manipulations of text than were previously made by these students.

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Two other studies using homogeneous groups support the use of the word processor in the teaching of writing. At Drexel University, Arms (1982) used a word processor with engineering majors. Her observations were that her students were more motivated by using the word processor, they made more revisions in their reports, and they gained confidence in their writing ability. Walker (1982) used word processing with second language students and observed that they gained confidence and made more revisions than they had previously.

Bean (1983), Diaute (1983a, 1983b), Monahan (1982), and Whitley (1983) have the opinion that word processing can help students revise more easily and skillfully, and can provide motivation often needed in the teaching of writing. Their opinions are supported by a survey done by Stromberg and Kurth (1983). After observing 16 eighth graders and noting student responses to an attitude questionnaire, Stromberg and Kurth found that students were very positive about their experiences with a word processing system. "Students' comments centered around the advantages of having their papers 'look

good,' and many cited the text editor's ease of use" (Stromberg & Kurth, 1983, p. 5). Stromberg and Kurth felt one of the greatest benefits of the experiment was the sharing that occurred because of the computer lab atmosphere.

Fisher (1983) and Hennings (1981), who both worked with elementary-level students and word processing, felt that those students who used word processing had a more positive attitude toward writing than those students who did not use word processing. Womble (1984) worked with 10 high school students and observed through their journal entries that they found the revision process less arduous. Because the revision process was easier, the students spent more time reworking text. Specifically, the students noted that they were able to find needed changes more easily and to develop a sense of audience.

Bridwell and Ross (1984) are using word processing with college freshmen as the core of their "learn to write by writing" philosophy. In the first year of their program, a survey was conducted of the students who participated in the writing program.

Seventy-five percent of the students responded, and of these, 63% described using the computer for writing as "a great advantage," 35% considered it "a useful tool," and one student saw it as a disadvantage. On another question, 80% thought using the computer improved their writing, and none thought it made their writing worse. When asked if it was useful for writing for their course, 65% said it was "very useful," 33% said "somewhat useful," and one said "not very useful" (p. 111). Students wanted more access to computers for writing, so Bridwell and Ross developed special classes just to teach word processing. The fact that students were willing to take an extra course to learn word processing shows their positive attitude toward word processing.

Ehrlich (1984) did a case study using community college students ranging in age from 18 to 55. Five of these students were observed in greater detail than the other students. Ehrlich observed student attitude through student journals, writing profiles, attitude surveys, and direct observation. Students demonstrated an improvement in attitude toward writing and more confidence as writers, which Ehrlich

attributed to the ease of editing caused by word processing. Deletions, additions, substitutions, and reordering were tabulated using six essays. Students revised more holistically, making more reordering revisions and substitutions, using word processing instead of making only minor revisions usually found in handwritten papers,. Ehrlich concluded that students who used word processing were more likely to view writing as a recursive process rather than a linear process. Because of her findings, she feels word processing can help students concentrate on revising as opposed to recopying.

A controlled study using two high school freshman composition classes in Naperville, Illinois, yielded inconclusive results (Hollman, 1984). Students in both the Control and Experimental Groups wrote one paper in four weeks. Observers collected revision counts on three drafts of this paper and researchers tallied counts of observed and/or written revisions. Students' attitude was surveyed through a questionnaire.

The results of the Naperville study indicated that the group using word processing made fewer

revisions, whether substantive or otherwise, than the Control Group, and the Experimental Group did not develop a more positive attitude toward writing than they had at the beginning of the study. The researchers felt the reasons for these results were the short period of time for the study, coupled with the inexperience of these students with word processing.

Many educators have been interested in the effect of word processing on students' attitude toward writing and on the types of revisions made by students. The results of the studies done by these educators lend support to the hypothesis that word processing facilitates the writing process. However, the studies cited have been largely observations made by teachers and students with little control and often using homogeneous groups. Clearly, well-designed research concerning word processing and the teaching of writing is needed.

Chapter III

METHODOLOGY

Procedures

Sixty seventh-grade students enrolled in a required writing course in a suburban midwestern junior high school were randomly placed by the school administration in one of two sections of the course. One section became the Experimental Group (n=29) and the other the Control Group (n=31). This required writing course emphasizes paragraph writing. Students are required to complete seven one-paragraph writing assignments during each nine weeks of the 18-week course. This study took place during the first nine weeks of the course. Each class met in the morning for 40 minutes a day. The Control Group met first, followed immediately by the Experimental Group.

Both groups were taught by the same teacher, an English teacher who has a strong academic background in writing and has taught writing for eighteen years. She is also knowledgeable and comfortable with word

processing. Both the Experimental and Control Groups received the same instruction, the same assignments, and the same amount of time for completing the assignments. For each paragraph written the student turned in a rough copy, and the teacher made comments on grammar and content of the paragraph. This copy was then returned to the student, who made whatever corrections he or she wanted to make. The corrected paper was handed in as a final copy. Papers did not have to be error-free to be acceptable. All papers were graded on content, grammatical accuracy, and form.

The difference between the Experimental and Control Groups was that the Experimental Group used a word processing computer program, while the Control Group used pencil or pen. The Control Group wrote the rough copy in pen or pencil and the final copy in pen. Neat erasures and white-out were allowed. The Experimental Group used word processing for all aspects of writing--prewriting through final copy. The students were taught very few word processing skills. They learned how to delete and insert, how to double space, and how to retrieve and save a file.

As individuals asked questions about specific word processing functions (e.g., how to center text), these questions were answered.

AppleWorks was chosen as the word processing software for this study because it is the word processing program used in the school's seventh-grade computer course. Approximately one-third of the Experimental Group were students who had already taken the required computer course and had some knowledge of AppleWorks. The students familiar with AppleWorks helped answer questions about AppleWorks asked by those students in the class who were unfamiliar with the word processing program. Although AppleWorks is easy to use, it also contains many sophisticated features for manipulating text. However, students' lack of knowledge of word processing and, in particular, of AppleWorks, limited their ability to make use of all its editing capabilities. For example, students might not have considered rearranging the order of sentences because they did not know how to move text in AppleWorks, or because they did not realize a word processor was capable of block moves.

There were 13 computers available for 31 students in the Experimental Group. It was anticipated that sharing computers would lengthen the time needed to complete assignments. Deadlines for work completion needed to be lengthened and in each case, this deadline was lengthened in both classes.

Most students lacked keyboarding skills. It was assumed that lack of keyboarding skills would lengthen the time needed to write the first copy of a paper in the Experimental Group. However, it was also assumed that the final revised copy would take less time to write in the Experimental Group because it did not have to be copied over as it did in the Control Group. Time was lengthened for each assignment, but it was impossible to determine if the time was lengthened because of sharing computers, or because of lack of keyboarding skills, or because of both of these.

Since use of word processing necessarily meant that the Experimental Group was required to complete all composition work at school, the Control Group was also required to complete composition work at school. The Experimental Group really received two-fifths of

the time to do their writing assignments because their writing time was limited to the time they could use the computers, and there were only enough computers to handle two-fifths of the students at a time. The students in the Control Group could use an entire class period to work on their writing since they were not limited by sharing computers.

Any use of the computer in the writing class other than for word processing, such as for computer-assisted spelling instruction or data-base book reports, was treated equally in both the Control and Experimental Groups. Allowing both Experimental and Control Groups equal access to computers for everything except word processing controlled for the novelty effect of the computer that Marcus (1984) mentioned.

Sample

Data for several students in the original sample were removed from the analysis. One student in the Experimental Group entered the course midway into the quarter, so he was excluded from the study. Two students in the Control Group and two in the

Experimental Group were transfer students. None of these transfer students were administered the 1984 Stanford Achievement Tests (SAT), so these four students were excluded from the SAT section of the study. The removal of these students left the Control Group with 26 students and the Experimental Group with 28 students.

Equal group sizes were necessary for some of the statistical tests used in the study, so two students from the Experimental Group were randomly chosen to be excluded from the study.

The groups of 26 that remained were used for the SAT section of the study. As a check to verify that the groups were not significantly different at the start of the study, the mean overall 1984 Stanford Achievement Test scores of both classes were compared using one way analysis of variance (ANOVA). The null hypotheses was supported ($p = .75$). Thus, it was assumed that the two classes were not significantly different at the beginning of the study.

There were 28 students in each group who correctly completed the pretest and posttest attitude

surveys. These 56 students were used in the attitude section of the study.

In each group 21 students turned in a rough and final copy of the paragraph used in this study. All 42 of these students were used in the revision section of the study.

Instruments

Five instruments, corresponding to the five research questions being investigated, were used: a measure of attitude toward writing, the spelling subtest of the Stanford Achievement Test, the language subtest of the Stanford Achievement Test, a measure of number of revisions, and a measure of level of revisions.

Attitude Toward Writing

Research to find an attitude survey with proven reliability indicated very little available. E. B. Silance and H. H. Remmers cited in Shaw and Wright (1967) used a Thurston-type scale to measure attitude toward any subject. It has a reliability score of

.68 for English, but has not been tested for reliability in the specific subject of writing. The Silance and Remmers scale was rejected for this study because the scale is very general and uses vocabulary difficult for seventh graders.

The researcher wrote the Fitch Attitude Toward Writing Survey (see Appendix for complete survey). The Fitch Attitude Toward Writing Survey consists of three parts, each using a different method of questioning to measure positive or negative attitudes toward writing. Part I contains 10 statements about writing. Five of the statements are written in a positive form and five in a negative form. The student rates each statement according to how often he or she does or does not like doing the writing task mentioned in the statement. For example:

I don't like taking out (deleting) words or sentences from a paragraph.

- _____ almost always
- _____ frequently
- _____ seldom
- _____ almost never

The scores for Part I range from a low of 10, which indicates a negative attitude toward writing, to a high of 40 which indicates a positive attitude toward writing.

Part II uses a nine-item Semantic Differential technique to assess attitude toward writing. Students describe how they feel about writing by putting an X on one of four blanks positioned between two words that describe writing. One word is positive and the other negative. Every other statement has the positive word first and the negative word last. For example:

fun _____ work

The range of scores for Part II is a low of 9, indicating a negative attitude toward writing, and a high of 36 indicating a positive attitude toward writing.

The scores on Parts I and II were added together, but Part III was examined separately. The last part of the survey, Part III, is an open-ended questionnaire containing two statements that the students complete:

1. Things I like about writing paragraphs:

2. Things I don't like about writing paragraphs:

The purpose of Part III is to assess the impact of word processing on students in the Experimental Group.

Validity. In order to provide content validity for the attitude survey, seven junior high school English teachers evaluated it. Appropriate changes were made, and the same teachers reevaluated the survey until the consensus of these teachers was that the survey did measure student attitude toward writing; in particular, attitude toward revision.

Reliability. To test for reliability, the Fitch Attitude Toward Writing Survey was administered to 50 randomly selected seventh and eighth graders not in the Experimental or Control Groups. The survey was administered at the beginning and end of the nine-week treatment period. The test-retest reliability of the instrument is .85.

Spelling

To measure students' ability to recognize misspelled words, the April 1984 and April 1985 scores on the spelling subtest of the Stanford Achievement Test were used. This subtest asks students to recognize the one misspelled word out of four listed.

Punctuation

To measure students' ability to recognize punctuation errors in writing, the April 1984 and April 1985 scores on the language subtest of the Stanford Achievement Test were used. The language subtest asks students to indicate incorrect punctuation in a phrase or clause.

Number of Revisions

The number of revisions was determined by the number of changes a student made between the first draft of a paper and the final draft of a paper. A revision is any word, part of a word, or punctuation mark that is inserted or deleted. Each word that was

changed counted as one revision, not as one deletion and one insertion.

Levels of Revision

Each revision was categorized into one to three levels: minor, intermediate, and major. To create categories that were generally acceptable, examples of revisions were given to four junior high writing teachers, and they were asked to categorize these as minor, intermediate, or major revisions. Revisions were placed in categories according to the consensus of these teachers.

Since the students in the study wrote only one-paragraph papers, the variety of types of revision was small. Examples of minor revisions are a spelling change, a punctuation change, and a one-word deletion or addition. Examples of intermediate revisions are insertion of a title and inserting, deleting, or moving two to four words. Examples of major revision are inserting, deleting, or moving a phrase or clause consisting of five or more words. Each major revision involves a minimum of five words and a maximum of one sentence.

Data Collection

General Procedure

The researcher did not teach the classes, but did have some contact with the students in this study. Therefore, data collection took place during the study, but the analysis of the data took place after the study was completed in order to avoid the researcher's inadvertently influencing the results of the study.

Attitude Toward Writing

Students in both the Experimental and Control Groups were given the Fitch Attitude Toward Writing Survey on the second day of class. The teacher refrained from reading these so that she would not inadvertently influence the attitude of an individual student based on what she read in a student's attitude survey. After the nine-week treatment period, the students were given the same survey again.

Spelling and Punctuation

Both 1984 and 1985 SAT subtest scores in spelling and language for the Experimental and Control Groups were recorded from school records. The study took place after the 1984 SAT tests were given and before the 1985 SAT tests were given.

Number and Levels of Revisions

Seven times within this nine-week study, students were given the assignment of writing a paragraph, and this paragraph was then revised and rewritten. Each paragraph assignment was given a number, and each numbered paragraph had two parts: 1) rough and 2) final.

Non-quantitative Data

Throughout the study the teacher and researcher wrote comments about the study in a journal. Successful teaching methods, problems that occurred, and specific suggestions of how to change procedures or teaching methods were among the topics written about in the journal. Appropriate observations from

this journal are included in the conclusion and recommendation sections of this report.

Data Analysis

Attitude Toward Writing

When the Fitch Attitude Toward Writing Survey was given to the Experimental and Control Groups, a test-retest design was used. Analysis of covariance was used to determine if there was a significant difference in attitude between the Control and Experimental Groups. The mention of word processing in Part III of the Fitch Attitude Toward Writing Survey was simply tabulated and noted.

Spelling and Punctuation

The 1984 and 1985 Stanford Achievement Test subtests of spelling and language were used in a test-retest design. Analysis of covariance using the 1984 scores as the covariate was used to determine if there was a significant difference between the Experimental and Control Groups.

Number of Revisions

To determine if there was a significant difference between the Experimental and Control Groups in the number of revisions made from the rough copy of a paragraph to the final copy of a paragraph, the number of revisions made from rough to final copy was tallied. The sixth of seven writing assignments was used for this data collection. This assignment was chosen to allow students time to become adept at using the word processing program and thus, this assignment was more likely to show how much word processing affects writing. Statistical significance was determined by chi square.

Levels of Revisions

To determine if there was a significant difference between the Experimental and Control Groups in the levels of revisions made from the rough copy of a paragraph to the final copy of a paragraph, the number of Level 1 revisions, Level 2 revisions, and Level 3 revisions made from rough to final copy were tallied. The same paragraph was used in this

tally as was used in counting the number of revisions. Each level was compared between the Control and Experimental Groups. Statistical significance was determined by chi square.

Chapter IV

RESULTS

Attitude Toward WritingParts I and III

Analysis of covariance was used for the statistical analysis of the survey data. Table 1 shows that there is no significant difference in attitude toward writing between the Control and Experimental Groups. Therefore the null hypothesis was supported. The Experimental Group's attitude toward writing changed the same amount as the Control Group's attitude toward writing.

Insert Table 1 about here

Part III

The mention of word processing in Part III was tabulated and noted. Two students out of 31

Table 1
Means, Standard Deviations, and ANCOVA F Ratios
On the Fitch Attitude Toward Writing Survey

Dependent Variable: Posttest, Fitch Attitude Survey (Parts I and II)				
Covariate: Pretest, Fitch Attitude Survey (Parts I and II)				
Experimental (N=28)		Control (N=28)		
Covariate Mean (SD)	Dependent Mean (SD)	Covariate Mean (SD)	Dependent Mean (SD)	F (df)
51.68 (8.15)	52.82 (7.58)	56.82 (6.07)	56.96 (7.48)	.19* (1,53)

* $p = .66$

in the Experimental Group mentioned word processing in a positive manner in Part III of the survey. No student mentioned word processing in a negative manner.

Spelling

Analysis of covariance using the pretest scores as the covariate was used for the statistical analysis of the 1984 and 1985 spelling subtest scores on the Stanford Achievement Test. As Table 2 shows, there was no significant difference found between the Control and Experimental Groups ($F(1,49)=2.54$; $p=.11$). Thus the null hypothesis was supported. Both the Experimental and Control Groups lowered their spelling subtest SAT scores a similar amount.

Insert Table 2 about here

Punctuation

Analysis of covariance using the pretest scores as the covariate was used for the statistical analysis of the Stanford Achievement

Table 2

Means, Standard Deviations, and ANCOVA F Ratios
On the Stanford Achievement Test Subtest of Spelling

Dependent Variable: 1985 SAT Spelling Subtest Score Covariate: 1984 SAT Spelling Subtest Score				
Experimental (N=26)		Control (N=26)		
Covariate Mean (SD)	Dependent Mean (SD)	Covariate Mean (SD)	Dependent Mean (SD)	F (df)
42.35 (6.12)	36.77 (7.70)	41.23 (7.54)	38.19 (8.90)	2.54* (1,49)

* $p = .11$

Test language subtest scores. The null hypothesis was supported as shown in Table 3 ($F(1,49)=1.72$; $p=.19$). No significant difference was found between the Experimental and Control Groups. Both the Experimental and Control Groups lowered their SAT language subtest scores a similar amount.

Insert Table 3 about here

Number or Revisions

Using the sixth of seven writing assignments, the number of revisions from rough to final copy was tallied. Statistical significance in number of revisions made by the Control and Experimental Groups was determined by chi square. The Control Group had a total of 479 revisions, and the Experimental Group had a total of 824 revisions. The null hypothesis was not supported ($\chi^2=91.35$, $p=.0001$). The Experimental Group made significantly more revisions than the Control Group.

Table 3

Means, Standard Deviations, and ANCOVA F Ratios
On the Stanford Achievement Test Subtest of Language

Dependent Variable: 1985 SAT Language Subtest Score
Covariate: 1984 SAT Language Subtest Score

Experimental (N=26)		Control (N=26)		F (df)
Covariate Mean (SD)	Dependent Mean (SD)	Covariate Mean (SD)	Dependent Mean (SD)	
44.19 (5.80)	44.62 (6.41)	45.04 (5.72)	46.85 (5.87)	1.72* (1,49)

* $p = .19$

Level 1 Revisions

Chi square was used to test for statistical significance in Level 1 revisions between the Control and Experimental Groups. The Control Group had 175 Level 1 revisions, and the Experimental Group had 132 Level 1 revisions. Significance was found to the .01 level ($\chi^2=6.02$). The Control Group made significantly more Level 1 revisions. Thus the null hypothesis was not supported.

Level 2 Revisions

The statistical test used to determine significance in Level 2 revisions was chi Square. The Control Group made 27 Level 2 revisions, and the Experimental Group made 26 Level 2 revisions. There was no statistical difference in Level 2 revisions between the Control and Experimental Groups ($\chi^2=.02$, $p=.89$). The null hypothesis was supported.

Level 3 Revisions

Chi Square was used to determine the statistical significance between the Control and Experimental Groups in Level 3 revisions. The Control Group made 18 Level 3 revisions, and the Experimental Group made 53 Level 3 revisions. The null hypothesis was not supported ($\chi^2=17.25$; $p=.0001$) The Experimental Group made significantly more Level 3 revisions than the control group.

Chapter V

DISCUSSION

Attitude Toward Writing

Students showed no change in their attitude toward writing as a result of using word processing for nine weeks. There are several possible reasons for this lack of change in attitude.

In Part III of the Fitch Attitude Survey students were asked to list what they did not like about writing paragraphs. Sixty percent of the students mentioned that they could not think of ideas to write about. Word processing does not address the problem of what students should write about, so word processing is not likely to change their attitude.

The lack of attitude change could also be attributed to the small amount of time the students had to get used to word processing. Change in routine is often difficult for children, and these seventh graders have had five or more

years of writing with pen and paper. Nine weeks is a very short time to get used to a change in something you have been doing for five years. Both Collier (1981) and Hollman (1984) found that the students in their studies had difficulty adjusting to word processing.

The lack of significant change in attitude as a result of word processing helps to refute Marcus's theory that students like whatever is related to the computer because they find the computer itself motivating (Marcus, 1984).

Spelling and Punctuation

In both the subtests of spelling and punctuation no significant difference was found between the scores of the Control and Experimental Groups. Thus word processing does not appear to affect students' recognition of spelling and punctuation errors. Word processing only makes the use of correct spelling and punctuation easier by making revision easier; word processing does not teach the use of correct punctuation or spelling. Spelling checkers and punctuation

checkers combined with word processing may be more likely to influence spelling and punctuation scores on standardized tests.

Levels of Revisions

The Control Group made significantly more Level 1 revisions, and the Experimental Group made significantly more Level 3 revisions. There was no difference between the groups in Level 2 revisions.

Word processing makes immediate revision very easy and neat. Therefore, the Experimental Group made many minor revisions when first writing the rough copy of the paragraph studied, so that the paper saved as the rough copy had minor revisions already made. It was not that the Experimental Group didn't make Level 1 revisions; rather that the Level 1 revisions were not counted between the rough and final copy because they were made before the rough copy was complete. The Control Group, however, was not able to revise easily. The rough copies of their paragraphs did not contain these minor revisions.

Since the Experimental Group had already made Level 1 revisions, these students could turn their attention to making higher level revisions in their rough copies. The Experimental Group also did not have to worry about making mistakes because these were easily corrected. In the Control Group, a mistake in the final copy meant having to copy the paper over. The Experimental Group would be more likely to spend time revising their paragraphs, because they did not have the time-consuming task of recopying their paragraphs.

Number of Revisions

The Experimental Group made significantly more revisions than the Control Group. Each word or punctuation change was counted as one revision. Since Level 3 revisions are longer than Level 1, and the Experimental Group made more Level 3 revisions, the Experimental Group added many more words and punctuation marks to their paragraphs than did the control group. As stated in the discussion of the Level of Revision, the Experimental Group made many more revisions than

the Control Group because the Experimental Group had the use of word processing and could make changes more easily.

Teacher Suggestions

The teacher noted that the students in the Experimental Group tended to share paragraphs with other students by saving other students' paragraphs on their disk.

She also noted that students learned word processing easily and quickly, and students were able to share machines fairly with no problems. The latter was very important because five students shared two machines, and equal access was a necessity.

Two students continued to use the computer for written work whenever possible after the study had ended. Since there was only one computer available to the class after the study ended, most students were not free to choose to write on a computer.

Recommendations for Future Studies

A major factor in the success of any study with computers is the amount of equipment available. Certainly future studies in word processing should strive for the maximum amount of equipment. This would include a computer per student plus a computer with a printer available at all times for printing out papers.

Keystroke computer programs that will count how many times a key is pushed on the computer are available. Use of a keystroke program would make it possible to tally the number of changes students made within copies, so Level 1 revisions could be more realistically tallied.

Preferably, students in future studies should have prerequisite keyboarding or typing skills. It is difficult for a student to write down thoughts freely if he or she is trying to find a letter on the keyboard. Only if students have keyboarding skills, can they express themselves freely and without loss of concentration.

The word processing program used in future studies should be chosen carefully. AppleWorks is very easy to use for junior high students, and learning it did not get in the way of their writing. A more cumbersome program might interfere with students' concentration on their writing just as lack of keyboarding skills does.

Teaching students simple typing rules (e.g., double spacing, two spaces after a period) is necessary, and teaching students how to rename their work makes it easy to be sure each draft is saved to disk. This avoids the problem of lost rough copies that have not been saved to disk, which is very important when collecting comparison data.

It is also recommended that each student have an individual data disk for which he or she accepts responsibility. Individual disks allow students always to have access to their work for writing or printing out. A class back-up can be kept also so that the teacher does not have to shuffle through a class set of disks to see the students' work.

The teacher used in future studies needs to be prepared for possible changes in classroom management. The changes noticed by the teacher in this study included:

1. The noise level in the classroom increased -- although the noise was productive.
2. The teacher needed to be flexible about assignment deadlines because machines were not always available.
3. Because students within the classroom were working on different tasks almost daily, the teacher continually moved about the room and answered questions. At no time could she sit down.
4. Some time was needed at the end of class to save work and clean up, and time was needed at the beginning of class to set up.

5. The students needed to take on the responsibilities of setting up, cleaning up and printing out papers. Otherwise, the teacher spent an inordinate amount of time on these tasks.

Conclusions

Word processing helps students to write better. This study has shown that seventh-grade students revise more and at a higher level when using a word processing computer program. This study has also shown that use of word processing does not change the attitude seventh graders have toward writing, nor does the use of word processing change seventh graders' ability to recognize spelling and punctuation errors. It is recommended that future studies use a keystroke program, students with some keyboarding experience, and one computer per student.

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Appendix

FITCH ATTITUDE TOWARD WRITING SURVEY

NAME _____

PER. _____

DATE _____

This questionnaire is designed to find out about your attitudes toward writing. Please answer the questions as frankly and as completely as you can. You are not graded on this, and it in no way affects your class grade.

PART I

DIRECTIONS -

For each statement place an "X" in the blank that is your answer.

1. I like to write paragraphs.

_____ almost always
 _____ frequently
 _____ seldom
 _____ almost never

2. I don't like to try different ways of organizing my sentences or paragraphs.

_____ almost always
 _____ frequently
 _____ seldom
 _____ almost never

3. I like to make changes in my rough copy of a paragraph.

_____ almost always
 _____ frequently
 _____ seldom
 _____ almost never

4. I think rewriting a paragraph after making corrections is a waste of time.

_____ almost always
 _____ frequently
 _____ seldom
 _____ almost never

5. Once a spelling or punctuation error in a paper has been pointed out, it is easy to correct.

- ☐ almost always
- ☐ frequently
- ☐ seldom
- ☐ almost never

6. After changes in sentence position have been pointed out to me, I still think changing the sentences around in a paragraph (moving sentences) is not worth the trouble.

- ☐ almost always
- ☐ frequently
- ☐ seldom
- ☐ almost never

7. I don't mind adding (inserting) words or sentences into a paragraph.

- ☐ almost always
- ☐ frequently
- ☐ seldom
- ☐ almost never

8. I don't like taking out (deleting) words or sentences from a paragraph.

- ☐ almost always
- ☐ frequently
- ☐ seldom
- ☐ almost never

9. I don't like to make the final copy of my paper.

- ☐ almost always
- ☐ frequently
- ☐ seldom
- ☐ almost never

10. I like to show my written work to others.

- ☐ almost always
- ☐ frequently
- ☐ seldom
- ☐ almost never

PART II

Following are some words and phrases which may describe feelings about writing. Mark your "feeling position" ON (not between) one of the lines. For example:

love _____ X _____ hate

This "X" shows that this person loves writing more than he/she hates it. If the "X" were in the blank right next to "love", the person would love writing very much.

frustrating _____	_____	_____	_____	enjoyable
easy _____	_____	_____	_____	difficult
a waste of time _____	_____	_____	_____	time well spent
fun _____	_____	_____	_____	work
a way I express myself _____	_____	_____	_____	not a way I express myself
something I'd like to do less _____	_____	_____	_____	something I'd like to do more
makes me nervous _____	_____	_____	_____	helps me relax
sometimes important to do _____	_____	_____	_____	rarely important to do
something I can be proud of _____	_____	_____	_____	something I get rid of right away

PART III

You do NOT need to write in sentences, but you do need to be specific. ("Everything" and "nothing" are not specific!)

A. Things I like about writing paragraphs:

B. Things I don't like about writing paragraphs: